Remote Operation of the Russian GLD

Idaho National Engineering and Environmental Laboratory

Technical Demonstration Summary Sheet
THE RUSSIAN GAMMA-LOCATOR DEVICE (GLD)

THE NEED

The Idaho National Engineering and Environmental Laboratory (INEEL) routinely decommissions facilities, which are no longer in use. Prior to a facility being decommissioned, it must be characterized in order to identify hazardous and radioactive materials, and establish plans for decontamination and dismantlement (D&D). Part of this initial characterization involves entering possible high radiation areas to identify sources and levels of radiation contamination. To do this, radiological control technicians enter the building and collect radiation measurements to determine the type, amount, and location of radiation present, as well as the physical nature of the contamination (loose or fixed), in the facility. A second entry is made by a team of sample technicians to collect physical samples of contaminated materials, which are shipped to a laboratory for analysis. These entries may result in exposure to workers that can be reduced or avoided by implementing remotely deployed technologies. Thus a method of characterization that reduces worker exposure is needed for areas where high radiation fields, unknown conditions, and/or worker exposure is of concern.

THE TECHNOLOGY

The Gamma-Locator Device (GLD) was designed by NIKIMT in Russia to provide remote gamma ray measurements during clean-up of the Chernobyl nuclear reactor. The Russian GLD is mounted on a radio-controlled robot (Irobot ATRV-Jr). Both the GLD and robot are battery powered. Rather than using humans to enter a contaminated facility for the first time when hazards are not well know, the robot caries the GLD, untethered, into the contaminated area. The GLD detects and transmits gamma ray readings remotely using radio communication to personnel located a safe distance from the contaminated area. In addition to collecting radiation field data, the GLD provides video images of the area being surveyed. The video information is transmitted to the operator using video frequency communication. The GLD itself weighs about 80 lbs. and the robot used in this demonstration weighs just more than 100 lbs. This technology is unique to conventional technologies because it operates on radio frequencies completely non-tethered and can maneuver and transmit around walls and corners. Second, it has a broader range of sensitivity (i.e., 60KeV to 6MeV compared to 100KeV to 2 MeV). And third, it has a broader scanning angle (i.e., 330° horizontal and 125° vertical compared to 73° horizontal and 55° vertical).

THE DEMONSTRATION

The Russian GLD demonstration was conducted in July 2001 at the INEEL Test Area North Building 616 (TAN-616). The technology was compared to the baseline characterization process of sending technicians into the contaminated area to collect samples, which are then sent to a laboratory for gamma analysis. For the baseline, an additional person is required during entry if photographs or video images of the facility are needed for D&D planning. The GLD was used to quantify radioactive contamination levels in the TAN-616 Operating Pump Room, Control Room, and the Pump Room and collect video images of the facility. One engineer was required to operate the GLD while a second scientist interpreted data. The robot required one engineer for operation and a second technician to operate external cameras. Both, operators of the GLD and robot, worked

from a control station outside of the contaminated building. In the future it is anticipated that a single person will operate both, GLD and robot.

THE RESULTS

The Russian GLD was able to identify numerous contaminated areas in the Operating Pump Room, Control Room, and in the Pump Room. Scan times during the demonstration ranged from 10 to 20 seconds per scanning point. Observed measurements ranged from 100 to 6600 counts per minute above background. Measurements by the GLD were presented in total counts over the set detection time, Roentgen/second, or Curies. The GLD has the capability to measure at distances ranging from less than a meter to 100 meters. A laser range-finder measures the distance for each radiation measurement. The hot spots found by the GLD correlated with those found by the radiological control and sample technicians. Because the GLD has the ability to do 100% coverage in a short period of time, it was able to detect hot spots previously undetected during baseline manual surveys. However, by using the GLD, fewer workers were exposed to potentially high radiation environments. The GLD data was collected in near real-time and was made available to D&D planners as needed. Because the robot and GLD are battery operated, and because the data and video are transmitted via radio frequency, there is no need for tether connection for communication or power. Use of the GLD can save weeks of schedule time by eliminating the need to send samples to a laboratory for analysis. By using the GLD fewer workers are required to enter a contaminated areas thus reducing their exposure to radiation. The GLD was deployed at the INEEL Power Burst Facility.

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BENEFITS

- Provides near real-time radiological data
- Provides video of the contaminated area with radiation overlay
- Operates remotely using radio frequency completely non-tethered
- Battery Operated
- Can provide full coverage radiation readings at much less cost
- Minimizes the need for workers to enter contaminated areas
- Greater sensitivity -- 60KeV to 6MeV
- Greater scanning angle -- 330° horizontal and 125° vertical.

Russian GLD Performing Gamma Scans

Russian GLD Maneuvering Through Debris